

'Statistical Blitz' Tackles Mammography Issue

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"Statistical Blitz" and "Unprecedented Statistical Attack" were terms used in the media to portray an effort by seven research groups comprised of 42 statisticians to determine if the introduction of mammography has anything to do with the 24% decline in breast cancer mortality that has occurred since 1990. The results, titled "Effect of Screening and Adjuvant Therapy on Mortality from Breast Cancer," were published in the Oct. 27 issue of *The New England Journal of Medicine* and reported on the front page of *The New York Times*.

The effort was undertaken by a consortium called Cancer Intervention and Modeling Network (CISNET), which is funded by the National Cancer Institute. It represents a relatively rare occurrence when statisticians take the lead role in an article for a major medical journal and get large headlines in papers across the nation. The approach used population data to describe the dissemination and usage patterns of mammography and adjuvant therapy that occurred throughout time in the United States. The usage patterns were then coupled with seven independent

modelers' synthesis of all available information on the benefits of these advances. Seven modelers plying their trades independently to the same problem and publishing their results simultaneously is unique, and it is important for understanding and quantifying the uncertainty associated with this type of modeling effort.

The authors make the case that each factor accounts for half of the historic 24% decrease in mortality actually observed between 1970 and 2000. The displayed graphic demonstrates the variability between the modeled results and suggests one way to combine them. In addition to its importance in addressing a substantive issue, the article provides an informative case study for understanding the modeling process itself.

While statisticians, like everyone else, like to get publicity for their work in high-profile places, the national media coverage this article received made it necessary to simplify the message to its essence. There is not a lot of space for all of the qualifying conditions careful statisticians like to put on their results.

"The first question reporters asked is why these results are important to the average American woman, and exactly how many

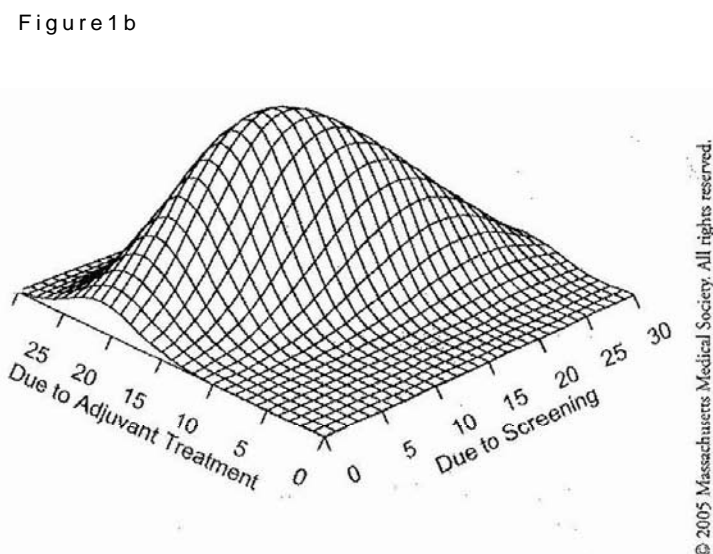
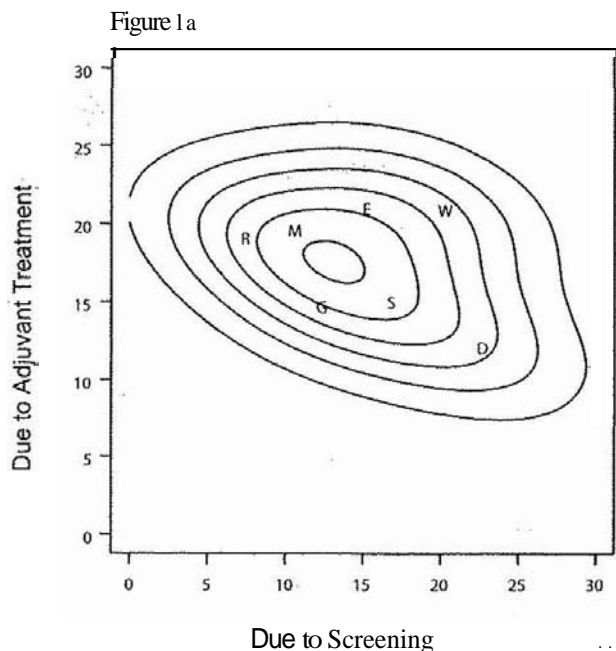


Figure 1a. Estimated joint distribution of percent reduction in breast cancer mortality for U.S. women aged 30-79 due to adjuvant treatment, compared to mortality in year 2000 in the absence of both screening and treatment. Figure 1a shows the estimates from the individual models in the table. The distribution contours for the combined model results are derived by kernel density estimation: each contour shows the focus of points having constant density. Each model's point estimate is assumed to be at the mean of its own bivariate normal density having covariance structure estimated from that of the seven model estimates. These seven densities were then averaged with equal weights to obtain estimated posterior joint distribution. The "hill" in Figure 1b is a three-dimensional rendering of the contour plot.

lives have been saved by mammography in the United States," said Kathy Cronin, NCI scientific coordinator of the breast cancer CISNET effort. "This number of lives saved is not explicitly provided in the NEJM article, [as] the modeled declines associated with mammography and adjuvant therapy are relatively robust to the exact level of background mortality, which would have occurred if these innovations had never been introduced. it is quite a challenge to describe these concepts to reporters," said Cronin.

"These types of situations take us enough out of our comfort zone that we often are tempted to withdraw into our computer labs with back issues of JASA and refuse to come out," quipped Eric J. (Rocky) Feuer, NCI program director for CISNET. "However, this tension is a healthy one," he continued. "And the effort to use models to inform policy debates is a guiding principle in CISNET."

A follow-up special monograph published by the Journal of the

National Cancer Institute will provide more details about this study. Links to the NEJM article and more information about CISNET can be found at <http://cisnet.cancer.gov> ■

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Reference: Donald A. Berry, Kathleen A. Cronin, Sylvia K. Plevritis, Dennis G. Fryback, Lauren Clarke, Marvin Zelen, Jeanne S. Mandelblatt, Andrei Y. Yakovlev, J. Kik F. Habbema, and Eric J. Feuer for the Cancer Intervention and Surveillance Modeling Network (CISNET) Collaborators. "Effect of Screening and Adjuvant Therapy on Mortality from Breast Cancer". The New England Journal of Medicine, 353:1784-92.